

REMARKS

Claim Status

Claims 1-25 are currently pending, with claims 1, 9 and 17 being in independent form. Claims 1, 9, 17, 18 and 21-24 have been amended. Claim 25 has been added. Support for the amendments to claims 1, 9 and 17 may be found, for example, in Figs. 3a and 3b and at paragraph [0050] and [0052] of published application 2005/0122035. No new matter has been added by way of this amendment. Reconsideration of the application, as amended, is respectfully requested.

Overview of the Office Action

Applicants acknowledge, with appreciation, the indication that claims 10 and 13-16 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 17 has been objected to because of a minor informality. Withdrawal of this objection is in order, as explained below.

Claims 1-3, 5, 6, 8, 9 11, 17 and 18 stand rejected under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 6133691 ("*Nakayama*").

Claims 4 and 12 stand rejected under 35 U.S.C. §103(a) as unpatentable over *Nakayama* in view of U.S. Patent No. 4,123,269 ("*Von Hoene*").

Claim 7 stands rejected under 35 U.S.C. 103(a) as unpatentable over *Nakayama* in view of U.S. Patent No. 6,828,042 ("*Imanishi*").

Claims 19-22 stand rejected under 35 U.S.C. §103(a) as unpatentable over *Nakayama* in view of U.S. Publication No. 2002/0064683 (“*Okada*”).

Claims 23 and 24 stand rejected under 35 U.S.C. §103(a) as unpatentable over *Nakayama* in view of PCT Pub. WO 00/04593 (“*Tessler*”).

Applicants have carefully considered the Examiner’s rejections, and the comments provided in support thereof, and respectfully disagree with the Examiner’s analysis. For the following reasons, Applicants respectfully assert that all claims of the present application are patentable over the cited references.

Amendments Addressing Section 112 issues and Formalities

The Examiner has stated that “OLFD should read OLED” in claim 17. Applicants have amended claim 17 in the required manner. Therefore, withdrawal of this objection is in order.

Descriptive Summary of the Prior Art

Nakayama discloses an organic light emitting element wherein light proceeding in parallel to an organic thin film, which ordinarily would be lost, can be effectively utilized (see col. 1, lines 64-67).

Von Hoene relates to “an overcoated, electrostatographic photoreceptor which can be fabricated in a flexible belt form on a plastic film base and is potentially capable of providing long life, panchromaticity and high speed operation” (see col. 2, lines 44-47).

Imanishi relates to an organic electroluminescence device in which light discharge efficiency is improved by adjusting the molecular orientation based on predetermined guidelines

to ensure that the transition dipole moment of the light emitting material has the optimum direction, and an intermediate layer is provided to adjust the refractive index and to obtain the optimum directivity (see *Abstract*).

Okada discloses an organic EL device, wherein a plurality of different electroconductive organic function material layers are selectively formed on a (single) substrate in a uniform thickness (see paragraph [0026]).

Tessler discloses a method for preparing nanoparticles from a mixture of nanoparticles for use with another material, wherein the mixture is washed with a solvent in which the nanoparticles are soluble to remove the other material from a solution of nanoparticles in the solvent (see pg. 4, line 28 to pg. 5, line 1).

Patentability of the Independent Claims under 35 U.S.C. §102(b)

Independent device claim 1 has been amended to recite “at least one first partial region with a first refractive index and a plurality of second partial regions with a second refractive index which is different from the first refractive index, said second partial regions forming irregularly arranged refractive index inhomogeneities in the organic layer”. Independent method claim 9 has been similarly amended.

Independent device claim 17 has been amended to recite “at least one first partial region with a first refractive index and a plurality of second partial regions with a refractive index which is different from the first refractive index, said second partial regions having different sizes and forming refractive index inhomogeneities in the organic layer”.

Support for the amendments may be found, for example, in Figs. 3a and 3b of the present invention. From these drawings, it is readily apparent to one skilled in the art that the organic layer exhibits refractive index inhomogeneities of differing sizes which are irregularly arranged in the organic layer. The feature associated with the different sizes (i.e., a size distribution or irregularly arranged index homogeneities) is also described, for example, in paragraphs [0050] and [0052] of present published application 2005/0122035. No new matter has been added.

The structure of the organic layer disclosed in *Nakayama* relies on resonant optical effects to improve the coupling-out of photons generated in the active layer. *Nakayama* (Fig. 16) shows a light emitting thin film that is composed of regions with different refractive indices. However, *Nakayama* fails to teach that “second partial regions [form] irregularly arranged refractive index inhomogeneities in the organic layer,” as recited in amended independent claims 1 and 9. In addition, *Nakayama* fails to teach that the “second partial regions [have] different sizes and [form] refractive index inhomogeneities in the organic layer,” as recited in amended independent claim 17.

Nakayama (col. 6, lines 52-53; Fig. 16) teaches that an organic light emitting thin film has the structure of a periodically arranged layer pattern in a direction perpendicular to the substrate, in addition to a direction parallel to the substrate. *Nakayama* (col. 9, lines 21-32) states “by forming the above-mentioned structures for confining emitted light in a light emitting film, it is possible to form an organic light emitting element such that a light resonator is obtained, and a classical or quantum effect (correction of light emission enhancement due to the transition probability mechanism) due to the light confinement or the light resonance can be applied to the light emitting element.” Thus, *Nakayama* teaches the organic light emitting thin

film is arranged in a regular, consistent pattern to obtain resonant optical effects and to form structures for confining emitted light in the light emitting film. In addition, *Nakayama* teaches that any deviations from the disclosed periodically arranged pattern, such as different sizes or an irregular arrangement, would disturb both the resonant optical effects and the desired confinement of light within the light emitting film.

In contrast, the second partial regions are not regularly arranged nor do all the partial regions have the same size. Rather, amended independent claims 1 and 9 recite that “[the] second partial regions [form] irregularly arranged refractive index inhomogeneities in the organic layer”. Amended independent claim 17 recites that “[the] second partial regions [have] different sizes and [form] refractive index inhomogeneities in the organic layer”. In contrast to the structure disclosed in *Nakayama*, the claimed structure of the present invention is designed to avoid optical confinement in the light emitting layer. Consequently, refractive index inhomogeneities formed by the second partial regions are brought into the light emitting layer in order to “consequently disturb the wave-guiding effects” (see paragraph [0030] of published application 2005/0122035).

Nakayama fails to teach the claimed structure that achieves the foregoing result. In fact, *Nakayama* achieves the exact opposite of what is achieved by the present claimed invention. *Nakayama* seeks to confine light within the light emitting layer and, thus, teaches away from the claim invention.

In view of the foregoing, Applicants respectfully assert that amended independent claims 1, 9 and 17 are not anticipated by *Nakayama*. Therefore, reconsideration and withdrawal of the rejection under 35 U.S.C. §102 is in order, and a notice to that effect is earnestly solicited.

Moreover, due to the fundamental above-discussed differences between the present claimed invention and *Nakayama*, it is clear that independent claims 1, 9 and 17 are patentable over this reference under 35 U.S.C. §103.

Patentability of the Claims under 35 U.S.C. §103(a)

The Examiner cites *Von Hoene* in an attempt to cure the shortcomings of *Nakayama*, i.e., the “organic layer has electrically inactive material,” as recited in dependent claims 4 and 12. However, the combination of *Nakayama* and *Von Hoene* fails to achieve the invention recited in amended independent claims 1 and 9, since *Von Hoene* also fails to teach or suggest that “[the] second partial regions [form] irregularly arranged refractive index inhomogeneities in the organic layer”. *Von Hoene* only teaches the use of an electrically inactive material. In view of the foregoing, Applicants respectfully assert that dependent claims 4 and 12 are patentable over the cited references, individually or in combination, based on their dependency on independent claims 1 and 9, respectively.

The Examiner cites *Imanishi* in an attempt to cure the shortcomings of *Nakayama*, i.e., “crystalline regions within an amorphous matrix material,” as recited in dependent claim 7. *Imanishi* (Fig. 15a) teaches an OLED with a homogenous light-emitting layer (e.g. layer 31), which is followed by one or more non-active intermediate layers (e.g. layer 30). However, *Imanishi* fails to teach the limitations associated with the second refractive index of the second partial regions, as recited in amended independent claim 1. In view of the foregoing, Applicants respectfully assert that dependent claim 7 is patentable over the cited references, individually or in combination, based on its dependency on independent claim 1.

The Examiner cites *Okada* in an attempt to cure the shortcomings of *Nakayama*, i.e., “matrix material is made from PPV and PVK,” as recited in dependent claims 19-22. *Okada* fails to teach the limitations associated with the second refractive index of the second partial regions, as recited in amended independent claim 17. In view of the foregoing, Applicants respectfully assert that dependent claims 19-22 are patentable over the cited references, individually or in combination, based on their dependency on independent claim 17.

Tessler has been cited to provide what *Nakayama* lacks, i.e. “second material regions are sphere shaped,” as recited in dependent claims 23 and 24. However, there is nothing in *Tessler* with respect to the claimed features associated with the second refractive index of the second partial regions, as recited in amended independent claim 17. Therefore, dependent claims 23 and 24 are also patentable over the cited references, individually or in combination, based on their dependency on independent claim 17.

Consequently, withdrawal of all the rejections under 35 U.S.C. §103 is in order for these additional reasons, and a notice to this effect is earnestly solicited.

Dependent claims

In view of the patentability of independent claims 1, 9 and 17, for the reasons presented above, each of dependent claims 2-8, 10-16 and 18-24, as well as new dependent claim 25, is patentable therewith over the prior art. Moreover, each of these claims includes features which serve to even more clearly distinguish the invention over the applied references.

Conclusion

Based on all of the above, it is respectfully submitted that the present application is now in proper condition for allowance. Prompt and favorable action to this effect and early passing of this application to issue are respectfully solicited.

Should the Examiner have any comments, questions, suggestions or objections, the Examiner is respectfully requested to telephone the undersigned in order to facilitate reaching a resolution of any outstanding issues.

It is believed that no fees or charges are required at this time in connection with the present application. However, if any fees or charges are required at this time, they may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,

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